2026 2nd International Conference on Medical Robotics and Artificial Intelligence (CMRAI 2026)

Conference Program

https://cmrai.org/

Organized by
University of Electronic Science and Technology of China

Co-organized by
Sichuan University
Sichuan Robotics Engineering Society
Beijing Zhuyitai Technology Co. Ltd

Technically Sponsored by
Hong Kong Society of Mechanical Engineers (HKSME)
IEEE Chengdu Section

Supported by
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WELCOME MESSAGE

Dear Participants,

Welcome to participate in 2026 2nd International Conference on Medical Robotics and Artificial Intelligence (CMRAI 2026). CMRAI 2026 will be held at Qingshuihe Campus of the University of Electronic Science and Technology of China (UESTC), Chengdu, China, from October 16 to 18, 2026. CMRAI 2026 is organized by the University of Electronic Science and Technology of China, co-organized by Sichuan University, Sichuan Robotics Engineering Society and Beijing Zhuyitai Technology Co. Ltd, technically sponsored by the Hong Kong Society of Mechanical Engineers(HKSME) and IEEE Chengdu Section, and supported by Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences and Shanghai Honjo Information Technology Co., Ltd, media supported by *Digital Technologies Research and Applications (DTRA)* and BCPMDAT.

CMRAI 2026 aims to provide a wonderful forum for you to update your knowledge base and explore the innovations in medical robotics and artificial intelligence. The conference will strive to offer you plenty of networking opportunities to meet and interact with the leading scientists, engineers and researchers, friends and colleagues as well as sponsors and exhibitors. We wish to meet all of you in person, face to face. And we hope you will join us for the festival of outstanding science and technology, and also take some time to enjoy the spectacular and unique beauty of surrounding regions in Chengdu, China.

On behalf of the organizing committee, I would like to thank the distinguished speakers: Prof. Hong Cheng, University of Electronic Science and Technology of China, China; Prof. Hongliang Ren, The Chinese University of Hong Kong (CUHK), HKSAR, China; Assoc. Prof. Shu Zhang, Fudan University Shanghai Cancer Center, China; Prof. Ying Shen, The First Affiliated Hospital with Nanjing Medical University, China; Prof. Fumihito Arai, The University of Tokyo, Japan; Prof. Chee-Kong Chui, National University of Singapore, Singapore; Prof. Rui Shi, West China Hospital, Sichuan University, China, Assoc. Prof. Zhangzhi Zhao, University of Electronic Science and Technology of China, China; Assoc. Researcher Xiaowei Tan, Shenyang Institute of Automation Chinese Academy of Sciences, China for sharing their deep insights on future challenges and trends.

We would like to thank all the committees for their great support on organizing the conference. We also would like to thank all the reviewers for their great effort on reviewing the papers submitted to CMRAI 2026. Special thanks to all the researchers and students who participate in the conference with their work.

We hope you enjoy the conference, the food, the hospitality, and the beautiful and charming city of Chengdu, China.

Regards,

Prof. Yifan Chen
Conference Chair of CMRAI 2026
University of Electronic Science and Technology of China, China

Prof. Hong Cheng
Conference Chair of CMRAI 2026
University of Electronic Science and Technology of China, China

Prof. Jing Zhang
Conference Chair of CMRAI 2026
Sichuan University, China

CONFERENCE KEYNOTE SPEAKERS

Keynote Speakers



Prof. Hong Cheng
University of Electronic Science and Technology of China, China

Biography: Cheng Hong, Professor and Doctoral Supervisor at the School of Mechanical and Electrical Engineering, University of Electronic Science and Technology of China, holds a Doctor of Engineering degree. He is a Leading Talent in Scientific and Technological Innovation under the National "Ten Thousand Talents Program", Dean of the School of Mechanical and Electrical Engineering, Director of the Ministry of Education Engineering Research Center for Human-Robot Intelligent Technology and Systems, Director of the Robot Research Center at the University of Electronic Science and Technology of China, Vice Dean of the Artificial Intelligence Research Institute, Honorary Director of the Intelligent Rehabilitation Committee of the Chinese Rehabilitation Medicine Association, Director of the Ethics Committee at the University of Electronic Science and Technology of China, and Chairman of the Sichuan Robot Engineering Society. His main research areas include artificial intelligence and robotics.

From July 2000 to November 2006, he served as an assistant lecturer (July 2000), lecturer (July 2002), and associate professor (January 2005) at the School of Electronic and Information Engineering, Xi 'an Jiaotong University, during which he obtained his Ph.D. in Control Theory and Control Engineering from Xi' an Jiaotong University in 2003. From December 2006 to December 2009, he conducted postdoctoral research at the School of Computer Science, Carnegie Mellon University. In January 2010, he became a professor at the School of Automation, University of Electronic Science and Technology of China, where he founded the Institute of Machine Intelligence. In July 2014, he co-founded the Robotics Research Center and served as its executive deputy director, executive director, and director. In June 2017, he became the director of the China FAW-University of Electronic Science and Technology Automotive Artificial Intelligence Joint Laboratory. In September 2018, he was appointed deputy dean of the Institute of Artificial Intelligence at the University of Electronic Science and Technology of China. In October 2019, he assumed the role of director at the Ministry of Education Engineering Research Center for Human-Machine Intelligent Technology and Systems. In February 2021, he became the director of the Ethics Committee at the University of Electronic Science and Technology of China. In July 2025, he was appointed chairman of the Sichuan Robotics Engineering Society.

Keynote Lecture: Frontier Developments in Brain–Computer Interfaces and Intelligent Rehabilitation Robotics

Brain–computer interfaces (BCIs) and intelligent rehabilitation robots stand at a critical inflection point, moving from "passive assistance" toward "intention-driven, active rehabilitation." As multimodal EEG/EMG signal decoding, intention perception, and motor-imagery recognition mature, the "central–peripheral–central" neural loop is being closed, shifting exoskeletons, rehabilitation robotic hands, wheelchairs, and similar devices away from program-driven motion and toward neuroplasticity training driven by the patient's own active intent. Drawing on more than a decade of sustained research by the team at the University of Electronic Science and Technology of China (UESTC), this report reviews frontier breakthroughs in rehabilitation BCI across signal acquisition (flexible dry electrodes and high-throughput semi-invasive electrodes), decoding algorithms, tight physical human–robot coupling control, and convergence with embodied intelligence. Taking

achievements such as the AIDER walking-assistance exoskeleton for paraplegia—its six generations of iteration, clinical validation, and industrial translation—as a case in point, it examines the practical pathway from technology to clinic to industry. Finally, against the challenges of decoding robustness, individualized adaptation, ethics and safety, and affordable access at the primary-care level, the report outlines the emerging trend of "embodied intelligence fused with brain–computer interfaces," offering perspectives for medical robotics R&D and clinical rehabilitation practice.



Prof. Hongliang Ren
The Chinese University of Hong Kong (CUHK), HKSAR, China

Biography: Prof. Hongliang Ren is a full professor at the Chinese University of Hong Kong (CUHK) in the Department of Electronic Engineering, where he received his Ph.D. in 2008. He has served as an Associate Editor for IEEE Transactions on Automation Science & Engineering (T-ASE) and Medical & Biological Engineering & Computing (MBEC). He has navigated his academic journey through Chinese University of Hong Kong, Johns Hopkins University, Children's Hospital Boston, Harvard Medical School, Children's National Medical Center, United States, and National University of Singapore (NUS).

His areas of interest include biorobotics, intelligent control, medical mechatronics, soft continuum robots, soft sensors, and multisensory learning in medical robotics. He is the recipient of the National Science Fund for Distinguished Young Scholars (Scheme A), CUHK Young Researcher Award, NUS Young Investigator Award and Engineering Young Researcher Award, IAMBE Early Career Award 2018, Interstellar Early Career Investigator Award 2018, ICBHI Young Investigator Award 2019, and Health Longevity Catalyst Award 2022 by NAM & RGC, Best Paper Awards in IEEE-ROBIO (2019 & 2013), IEEE-RCAR2016, IEEE-CCECE2015, IEEE-Cyber2014 among 30+ other prestigious awards.

He has been constantly listed among the world's top 2% of the most-cited scientists by Stanford University in the career-long category. He has published over 240 papers, accumulating more than 23,000 citations and achieving an H-index of 77.

Keynote Lecture: Endoluminal Robotics & Embodied AI in vivo

Minimally Invasive Surgeries (MIS) emerging in modern medical treatment have brought new opportunities and challenges for procedure-specific surgical motion generation and the associated motion understanding, which are the foundation of intelligent robotic manipulation and guiding interventions. Image-guided robotic surgery is expected to increase the precision, flexibility, and repeatability of surgical procedures but poses challenges for system development. This talk will highlight our recent developments in dexterous robotic motion generation with motion perception towards intelligent image-guided minimally invasive procedures. The procedure-specific telerobotic surgical systems can assist surgeons in performing dexterous manipulations using continuum motion generation mechanisms with variable stiffness and context awareness.



Assoc. Prof. Shu Zhang
Fudan University Shanghai Cancer Center, China

Biography: Shu Zhang works in the Department of Surgical Oncology at Fudan University Shanghai Cancer Center. He is also an Associate Professor at City University of Hong Kong and East China University of Political Science and Law, a doctoral supervisor in medicine and a master's supervisor in law, an expert in health law and governance of the National Health Commission, and President of Fuyuan County People's Hospital.

He is a Standing Committee Member of the Chinese Association of Integrative Medicine and the China Association of Chinese Medicine; a Committee Member of the Chinese Research Hospital Association and the Medical-Engineering Translation and Industrial Integration Committee; and a Standing Committee Member of the Shanghai Anti-Cancer Association, Shanghai Association of Integrative Medicine, Shanghai Pharmacological Society, Shanghai Law Society, Chongqing Law Society, among others. He has been selected for the Shanghai Science and Technology Innovation "Rising-Star Program" and "Yangfan Talent," the Shanghai Science and Technology Youth 35 Leading Program, and the 25 Talents for Major National Needs, and recognized as a CSCO "35under35" Outstanding Young Oncologist.

He has served as principal investigator for 2 national-level and 7 provincial/ministerial-level research projects. He has published dozens of SCI-indexed papers and holds multiple invention patents. His achievements include the world's first robotic NOSE (natural orifice specimen extraction) surgery and China's first single-port robotic surgery. He received the Best Research Award at the World Congress of Clinical Robotic Surgery. He has led or participated in multiple international multicenter studies, and his work has been cited in international guid

Keynote Lecture: The Path to AI Surgery: From Laparoscopy to Robotic Surgery



Prof. Fumihito Arai
The University of Tokyo, Japan

Biography: Fumihito Arai is a full Professor of the Department of Bioengineering, Department of Mechanical Engineering, at The University of Tokyo, Japan. He is mainly engaging in the research fields of bio-robotics, micro- and nano-robotics, micro- and nano-mechatronics, MEMS, and Biomedical applications. He received a Doctor of Engineering degree from Nagoya University in 1993. Since 1998, he has been an Associate Professor at Nagoya University. Since 2005, he has been a Professor at Tohoku University. Since 2010, he has been a Professor at Nagoya University. Since 2020, he has been a Professor at the Department of Mechanical Engineering at The University of Tokyo.

Keynote Lecture: Grand Challenge on Cybernetic Avatars within the Body

For medical and healthcare purposes, small robots have garnered significant attention recently. These robots are designed to autonomously explore the human body's vascular and digestive systems, performing medical procedures and monitoring various healthcare tasks. Further improvements in wireless sensing and actuation methods, communication technologies, and system interfaces are required as design methodologies for small robot systems, necessitating the promotion of innovation in this field. We are promoting a project to develop a cyber-physical system utilizing avatars and small-scale robots within the body that can be operated remotely and safely. We refer to them as In-body cybernetic avatars (In-body CA). In-body CA consists of small robots, a network-connected operating system, and an avatar capable of interacting with users, including information processing, retrieval, and presentation. This enables not only safe monitoring of internal conditions, but also in-body operations including tumor resection, sampling, and pinpoint drug delivery. Improving the operability of teleoperation of these robots enhances safety during operation, such as resection of lesions on the surface of the large intestine. We developed a traction device for endoscopic submucosal dissection and verified its feasibility using prototypes and patient simulators. Furthermore, we have studied non-invasive sampling technologies within the body necessary for biological diagnostics, thereby reducing the burden on patients. Emerging technologies for In-body CA will be introduced, highlighting how they expand capabilities in the microscopic world, particularly within the medical and healthcare fields.



Prof. Chee-Kong Chui
National University of Singapore, Singapore

Biography: Chee-Kong Chui is an Associate Professor in the Department of Mechanical Engineering at the National University of Singapore (NUS), where he also serves as Deputy Head for Undergraduate Programmes and chairs the Department Academic Affairs Committee. He is also a Faculty Member of the Integrative Sciences and Engineering Programme at the NUS Graduate School. His research interests include medical and surgical robotics, computer vision and artificial intelligence for healthcare, medical simulation and training, tissue biomechanics, and intelligent automation. His research focuses on integrating robotics, sensing, computational modelling, and artificial intelligence to develop intelligent systems for healthcare and advanced engineering applications. In medical robotics, his work includes image-guided interventions, robotic surgical assistance, medical simulation, computer-assisted diagnosis and treatment, and biomechanical modelling of soft tissues. He has also worked extensively on cyber-physical systems, digital twins, and AI-enabled automation for advanced manufacturing. He has led and participated in multidisciplinary research projects involving academic, clinical, and industrial collaborators, with an emphasis on translating engineering technologies into practical systems. His current work includes the development of robotic and AI technologies for surgery and healthcare, as well as intelligent robotic automation and digital-twin technologies for complex laboratory and manufacturing environments. Dr Chui is a Senior Member of IEEE and Co-Chair of the IEEE Systems, Man, and Cybernetics Society Technical Committee on Cyber-Medical Systems. He is also active in international conferences and editorial activities in robotics, automation, and medical technologies.

Keynote Lecture: From Medical Robotics to Intelligent Healthcare Systems: Integrating Robotics, AI and Digital Twins

Medical robotics is evolving from conventional computer-assisted and teleoperated systems towards increasingly intelligent platforms capable of sensing, reasoning, prediction, and adaptive interaction with clinicians, patients, and complex healthcare processes. This evolution is being accelerated by advances in artificial intelligence, computer vision, biomechanical modelling, digital twins, and increasingly capable robotic and automation technologies. In this talk, I will discuss our work towards intelligent medical and healthcare systems through the integration of robotics, AI, computational modelling, and digital twins. Examples will include image- and vision-guided medical robotics, computational modelling of soft-tissue behaviour, surgical simulation and training, and AI-assisted interpretation of medical and procedural information. I will also discuss how patient- and procedure-specific digital representations can be combined with sensing and robotic systems to support planning, prediction, and intraoperative decision-making. Beyond surgical applications, similar technologies are increasingly relevant to intelligent and high-throughput drug development. I will present our work on robotic laboratory automation and digital-twin-based modelling of complex laboratory workflows, where robotics, AI, process optimisation, and cyber-physical systems can be integrated to improve throughput, resource utilisation, reproducibility, and operational efficiency in pharmaceutical research and development. A key challenge across these applications is how individual algorithms and robotic technologies can be integrated into systems that are reliable, usable, scalable, and practically meaningful. Issues such as real-time performance, physical interaction, uncertainty, human-machine collaboration, workflow optimisation, and translation from laboratory prototypes to real-world healthcare and pharmaceutical environments will therefore be considered. The talk will conclude with perspectives on the progression from robotic assistance towards more context-aware and intelligent healthcare systems, and on the complementary roles of humans, robotics, artificial intelligence, and digital twins in the future of healthcare and drug development.



Prof. Rui Shi
West China Hospital, Sichuan University, China

Biography: Rui Shi, Director of the Information Center at West China Hospital, Sichuan University, is a member of the Communist Party of China, a Doctor of Clinical Medicine, Chief Physician in the Department of Orthopedics at West China Hospital, Sichuan University, and a Medical Team Leader. He currently serves as Director of the Information Center at West China Hospital, Sichuan University. He previously served as Party Secretary of Ganzi Tibetan Autonomous Prefecture People's Hospital (West China Ganzi Hospital) and was a member of the 9th batch of experts dispatched to assist Xinjiang by the Organization Department of the CPC Central Committee. He is a member of the Pelvic Ring Group of the Chinese Anti-Cancer Association; a member of the Youth Committee of the Foot and Ankle Professional Committee of the Chinese Medical Doctor Association; a member of the Wound Repair Branch of the China Association of Medical Equipment; Vice President of the Operations Management Branch of the Sichuan Hospital Association; Council Member of the Urban Hospital Working Committee of the Sichuan Hospital Association; and Vice Chairman of the High Altitude Medicine Branch of the Sichuan International Medical Exchange and Promotion Association. He has published more than 40 articles in domestic and international journals, including 20 SCI-indexed articles. As a principal investigator, he has undertaken 5 government-funded vertical research projects supported by the Sichuan Provincial Department of Science and Technology, the Sichuan Provincial Department of Health, and the Chengdu Municipal Bureau of Science and Technology, as well as 2 GCP contract research projects. He has participated in National Science and Technology Major Projects, General Projects of the National Natural Science Foundation of China, 4 projects under the Support Program of the Sichuan Provincial Department of Science and Technology, and 5 clinical research-related contract projects. He has participated in the compilation of 6 professional books, applied for 5 patents, and successfully commercialized/transferred 2 patents.

Keynote Lecture: AI-Empowered Smart Hospital Construction and Multi-Agent Practice



Assoc. Prof. Zhangzhi Zhao
University of Electronic Science and Technology of China, China

Biography: Zhao Zhangzhi, Deputy Director of the Sports Department of University of Electronic Science and Technology of China, member of the expert group of the National Science and Technology Sports Research Institute of University of Electronic Science and Technology of China, director of the Special Committee of the Integrated Microsystem for Intelligent Perception Fusion and Secure Mobile Payment, deputy director of the Key Laboratory of Sports Medicine of Sichuan Province, and national-level project review expert. He has been engaged in interdisciplinary research combining sports, medicine and engineering in areas such as human-computer intelligence and health engineering technology, and human performance enhancement technology for a long time.

Keynote Lecture: Research on the Application of Biomedical Engineering Integration Technology in Sports Science

Artificial intelligence is increasingly being applied in the field of sports science. This report systematically presents the research progress of artificial intelligence technology in areas such as sports performance assessment, rehabilitation training, and development of intelligent assistive devices. Artificial intelligence is being increasingly applied in the field of sports science. This report systematically presents the research progress of artificial intelligence technology in areas such as sports performance assessment, rehabilitation training, and development of intelligent assistive devices. It highlights the construction of a human-machine collaborative intelligent system through key technologies such as multimodal physiological perception, brain-computer interface, photoacoustic imaging, and human-machine intelligence, and has achieved results in clinical rehabilitation and sports training. These achievements have significantly improved the efficiency of sports rehabilitation and training, and demonstrate a broad development prospect.



Prof. Ying Shen
The First Affiliated Hospital with Nanjing Medical University, China

Biography: Ying Shen is a Professor and Chief Physical Therapist, as well as a doctoral supervisor, at the First Affiliated Hospital with Nanjing Medical University, where she serves as Deputy Director of the Department of Rehabilitation Medicine. Her research focuses on neurorehabilitation, neuromodulation, and brain-computer interfaces. She has published more than 70 SCI-indexed papers and has led eight research projects, including projects funded by the National Key R&D Program of China and the National Natural Science Foundation of China.

Keynote Lecture: Advancing Stroke Rehabilitation Through Neuromodulation and Brain–Computer Interfaces

Panel Guests



Assoc. Prof. Shu Zhang

Fudan University Shanghai Cancer Center, China



Prof. Ying Shen

The First Affiliated Hospital with Nanjing Medical University, China



Prof. Rui Shi
West China Hospital, Sichuan University, China



Assoc. Researcher Xiaowei Tan
Shenyang Institute of Automation Chinese Academy of Sciences, China

Biography: Xiaowei Tan is an Associate Researcher at the Shenyang Institute of Automation, Chinese Academy of Sciences (SIA, CAS), and a member of the State Key Laboratory of Robotics and Intelligent Systems. His research focuses on soft exoskeleton robotics, human motion analysis, and human–robot interaction control. He has served as principal investigator for a research task under the National Key R&D Program of China, a Young Scientists Fund (C) project of the NSFC, and several national postdoctoral research projects (General Funding, Postdoctoral Fellowship Program, and Special Funding). His research has been published in international journals, including IJRR, IEEE T-RO, IEEE T-ASE, IEEE T-IM, and IEEE T-HMS.

PRESENTATION GUIDE

Oral Presentation

1. File format: MS-PowerPoint (*.ppt) or Adobe PDF (*.pdf)

   PPT size: **16:9**

2. Time: About 12mins, including Q/A time.

3. Language: English

4. Fonts: Arial or Times New Roman

5. Dress code: Formal clothes

6. Facility: Presenters need to copy their PPT on conference computer, please arrive at the venue before your presentation time to upload your slides.

7. Online conference software: **Tencent VooV**

Poster Presentation

1. Poster Size: **1m*0.8m (height*width)**.

2. Language: English.

3. Poster format: jpg

4. The poster should include: paper ID, conference name's acronym, significance of the research, the methods used, the main results obtained, and conclusions drawn.

5. Posters are required to be condensed and attractive.

6. The conference organizer won't send/keep any posters after the conference.

Minutes of Q&A

Keynote Speech: 30 Minutes of Presentation including 5 minutes' Q&A
Oral Presentation: 12 Minutes of Presentation including 2 minutes' Q&A

NOTICE:

- Certificate of Participation will be awarded after presentation.
- One best presentation will be selected from each session. The best one will be announced when each session ends, and will be awarded with a "Best Presentation" certificate.

Online Conference Operation Guide—

VooV(腾讯会议)

- **CMRAI 2026 线上会议信息(Online Conference Information):**

时区（Time Zone）	Beijing Time，GMT+8
会议时间 (Conference Time)	Oct. 16-18, 2026
在线会议室 ID (Online Room ID)	**867-7048-3299** （入会密码(password): **1017**）
链接(Link)	https://meeting.tencent.com/dm/xMuaw7TvP3LO

- **线上测试信息(Online Testing):**

All the participants can join the conference room during the testing time; the conference secretary will arrange the participants who will do the presentation to test one by one. (p.s. Conference ID keeps the same as testing ID)

Room ID: 867-7048-3299 (password: **1017**) **Link:** https://meeting.tencent.com/dm/xMuaw7TvP3LO	
测试时间 (Testing Time)	Participants
15:30-16:30 Oct. 14, 2026 Beijing Time，GMT+8	Oral presenters: **M085, M086, M092, M094, M098, M099, M118**

- **操作指南(Operation Guide):**

1. 会议视频软件(video meeting software): VooV

下载链接(download link)：
A.) Chinese Version
https://meeting.tencent.com/download-mac.html?from=1001&fromSource=1 (Mac OS)
https://meeting.tencent.com/download-win.html?from=1001&fromSource=1 (Windows)

B.) International Version
https://voovmeeting.com/download-mac.html?type=1&from=1000（Mac OS）
https://voovmeeting.com/download-win.html?type=x86_64&from=1000 （Windows）

2. 加入会议(Join the Conference)：

方法一：点击会议链接，或选择“加入会议”后输入会议 ID。进入会议室时需填写手机号码进行验证；验证完成后在入会名称处输入您的“文章编号+姓名”即可进入。
Method 1: Click the Conference link, or click “Join the conference”, then input the Conference ID. When you join the conference room, you need to fill in your phone number for authentication, then

fill in your "Paper ID +Name" at the "Name" to join the conference.

注：如您不能以游客身份直接"加入会议"，建议您按照方法二注册一个账号，登录后再加入会议。
Tip: Should you fail to "Join the Conference" as a visitor, we suggest you register an account by method 2, then log in and join the conference.

方法二：您可在腾讯会议 APP 或官网（https://meeting.tencent.com/）中进行注册，登录后通过链接或输入会议 ID 加入会议。
Method 2: You can register at the APP/ website (https://www.voovmeeting.com/), log in and join the conference by the link or tap the Conference ID.

注意(Note):

- 所有出版的论文需保证至少有一位作者出席线上会议并**全程保持在线**。
- Presentation of paper must be done on the conference by one of author(s) of the paper. Otherwise, the paper cannot be included into the conference proceeding.

- 会议将**全程进行录制**，作为提交出版社的材料之一。
- We'll record the whole conference. If you do mind, please inform us in advance. The recording will be used for conference program and paper publication requirements. It cannot be distributed to or shared with anyone else, and it shall not be used for commercial nor illegal purpose.

- 会务组将在会议**前 10-15 分钟进行点名**，请各位作者至少提前 10-15 分钟加入会议室。会议秘书将于会议当天提前四十五分钟打开会议室等待各位加入。
- The conference committee will **call the roll 10-15 minutes before** our conference, please join the conference in advance for at least 10-15 minutes. The conference secretaries will be waiting before forty-five minutes the conference starts.

- 会议期间**务必戴上耳机**以防外界噪音。同时建议请保持视频开启，持续在线。
- Please **wear headphones** during the meeting to block out the outside noise. Keeping the video on and keeping online are suggested.

- 请提前测试会议软件。
- Please test the video meeting software in advance.

- 如有任何疑问，您可点击 https://meeting.tencent.com/以获取帮助，或联系会议秘书：+86-19983106382(中国)，+852-30506862（中国香港）。
- Should you have any further questions about this operation guide, please click https://www.voovmeeting.com/ for help. You can also contact the conference secretary at +86-19983106382 (China), +852-30506862(Hong Kong).

CMRAI 2026 CONFERENCE PROGRAM OVERVIEW

Conference Dates: Oct. 16-18, 2026
Venue: Qingshuihe Campus of the University of Electronic Science and Technology of China, Chengdu, China
ADD.: No. 2006, Xiyuan Avenue, Gaoxin District, Chengdu, Sichuan Province

DAY 1 - Oct. 16, 2026 | Beijing Time: GMT+8 | Friday		
10:00-13:30	**Item**	**Registration and Conference Kits Collection**
	Venue	*Music Room*(天韵厅), *2F, Library*
13:30-17:30	**Item**	**Industrial Visit**
	Venue	*Buffalo*
DAY 2 - Oct. 17, 2026 | Beijing Time: GMT+8 | Saturday		
Keynote Speech Session		
Offline Venue: *Movie Room*(光影厅), *2F, Library*		
09:00-09:10	**Opening Ceremony**	
09:10-09:40	**KN 1** - Cheng Hong	**Keynote Lecture:** Frontier Developments in Brain–Computer Interfaces and Intelligent Rehabilitation Robotics
09:40-10:10	**KN 2** - Hongliang Ren	**Keynote Lecture:** Endoluminal Robotics & Embodied AI in vivo
10:10-10:30	**Coffee Break & Group Photo**	
10:30-11:00	**KN 3** - Shu Zhang	**Keynote Lecture:** The Path to AI Surgery: From Laparoscopy to Robotic Surgery
11:00-12:00	**Item**	**Panel Discussion**
	Venue	*Movie Room*(光影厅), *2F, Library*

12:00-13:30	**Lunch** **Venue:** *Furong Restaurant*			
13:30-14:00	**KN 4-** Ying Shen	**Keynote Lecture:** Advancing Stroke Rehabilitation Through Neuromodulation and Brain–Computer Interfaces		
14:00-14:30	**KN 5-** Fumihito Arai	**Keynote Lecture:** Grand Challenge on Cybernetic Avatars within the Body		
14:30-15:00	**KN 6-** Chee-Kong Chui	**Keynote Lecture:** From Medical Robotics to Intelligent Healthcare Systems: Integrating Robotics, AI and Digital Twins		
15:00-15:15	**Coffee Break & Poster Session**			
15:15-15:45	**KN 7-** Rui Shi	**Keynote Lecture:** AI-Empowered Smart Hospital Construction and Multi-Agent Practice		
15:45-16:05	**KN 8-** Zhangzhi Zhao	**Keynote Lecture:** Research on the Application of Biomedical Engineering Integration Technology in Sports Science		
16:05-17:30	**Technical Session I (Online)**		**Technical Session II (Offline)**	**CMRAI 2027 Organizing Meeting**
	Online Room: 867-7048-3299/Password: 1017		*Music Room(天韵厅), 2F, Library*	*Movie Room*(光影厅)*, 2F, Library*
	M085, M086, M092, M094, M098, M099, M118		**M102, M103, M106, M107, M105**	
18:30-20:00	**Dinner**			
DAY 3 - Oct. 18, 2026 | Beijing Time: GMT+8 | Sunday				
09:40-12:00	**Item**	**Laboratory tour** *On-campus*		

TECHNICAL SESSIONS

Keynote Speech

Chair: *Yifan Chen*, University of Electronic Science and Technology of China, China

09:00-16:05, Oct. 17, Saturday

Offline Venue: Movie Room(光影厅), (2F, Library)
Qingshuihe Campus of the University of Electronic Science and Technology of China
Online Room: 867-7048-3299/Password: 1017

Time	No.	Content	Page
09:00-09:10	**Opening Ceremony**		
09:10-09:40	KN1	Frontier Developments in Brain–Computer Interfaces and Intelligent Rehabilitation Robotics ***Prof. Hong Cheng,*** University of Electronic Science and Technology of China, China	2
09:40-10:10	KN2	Endoluminal Robotics & Embodied AI in vivo ***Prof. Hongliang Ren,*** The Chinese University of Hong Kong (CUHK), HKSAR, China	4
10:10-10:30	**Coffee Break & Group Photo**		
10:30-11:00	KN3	The Path to AI Surgery: From Laparoscopy to Robotic Surgery ***Assoc. Prof. Shu Zhang,*** Fudan University Shanghai Cancer Center, China	5
11:00-12:00	Panel Discussion	"Application Prospects of Artificial Intelligence in the Field of Medical Robots" Host: ***Jingting Zhang***, University cf Electronic Science and Technology of China, China	***Shu Zhang,*** Fudan University Shanghai Cancer Center, China ***Ying Shen***, The First Affiliated Hospital with Nanjing Medical University, China ***Rui Shi,*** West China Hospital, Sichuan University, China ***Xiaowei Tan***, Shenyang Institute of Automation Chinese Academy of Sciences, China
12:00-13:30	**Lunch** **Venue:** *Furong Restaurant*		
13:30-14:00	KN4	Advancing Stroke Rehabilitation Through Neuromodulation and Brain–Computer Interfaces ***Prof. Ying Shen***, The First Affiliated Hospital with Nanjing Medical University, China	10

14:00-14:30	KN5	Grand Challenge on Cybernetic Avatars within the Body ***Prof. Fumihito Arai,*** The University of Tokyo, Japan	6
14:30-15:00	KN6	From Medical Robotics to Intelligent Healthcare Systems: Integrating Robotics, AI and Digital Twins ***Prof. Chee-Kong Chui,*** National University of Singapore, Singapore	7
15:00-15:15	**Coffee Break & Poster Session**		
15:15-15:45	KN7	AI-Empowered Smart Hospital Construction and Multi-Agent Practice ***Prof. Rui Shi,*** West China Hospital, Sichuan University, China	8
15:45-16:05	KN8	Research on the Application of Biomedical Engineering Integration Technology in Sports Science ***Assoc. Prof. Zhangzhi Zhao,*** University of Electronic Science and Technology of China, China	9

Technical Session I

Chair: *Pengjie Qin*, Shenzhen University, China

16:05-17:29, Oct. 17, Saturday

Online Room: 867-7048-3299/Password: 1017

Time	No.	Content	Page
16:05-16:17	M085*-Online	DRLKC3D: Dense Re-parameterized Large-Kernel 3D Convolution for UPDRS Toe-Tapping Assessment **Presenter: *Haoyu Tian,*** Qingdao University of Science and Technology, China **Authors:** *Haoyu Tian, Tongjie Zhang*	21
16:17-16:29	M086*-Online	Explainable Ensemble Learning for Heart Disease Prediction with Bayesian Optimization **Presenter: *Kwok Tai CHUI,*** Hong Kong Metropolitan University, Hongkong, China **Authors:** *Ritika Kalia, Sudhakar Kumar, Sunil K. Singh, Dhruv Bali, Mani Bansal, Shavi Bansal, Brij B. Gupta, Kwok Tai Chui*	21
16:29-16:41	M092*-Online	Comparative Evaluation of Models for Post-Baseline Cardiovascular Event Classification Using Multi-Source Baseline Data and Transformer-Based Fusion **Presenter: *Emily Chen Kuo,*** Brookline High School, US **Authors:** *Emily Chen Kuo, Tiffany Chen Kuo, Yu-Sheng Lin, and Ming-Huang Chen*	22

16:41-16:53	M094*-Online	Dynamic Early Warning for Elderly Chronic Disease Patients Under Partial Temporal Observation **Presenter:** ***Honghan Ke,*** Hainan University, China **Authors:** *Honghan Ke, Yuanyuan Wu, Zikai Feng, Mengxing Huang*	22
16:53-17:05	M098*-Online	Cascaded-REASON: A Framework from Contextual Understanding to Chain-of-Thought Reasoning for Clinical Decision Support Systems **Presenter:** ***Wuyang Huang,*** Hainan University, China **Authors:** *Wuyang Huang，Zikai Feng，Aslam Bhatti Uzair，Mengxing Huang*	23
17:05-17:17	M099*-Online	YOLO11n-Based Computer-Assisted Recognition of Diabetic Retinopathy Lesions in Fundus Images **Presenter:** ***Zhihao Shi,*** Shihezi University, China **Authors:** *Zhihao Shi;Yuqin Niu;Jing Xiao;Yuting Xian;Xin Tian;Yunfei Wang*	23
17:17-17:29	M118*-Online	MFO-DRNet: Multi-Scale Feature Fusion with Ordinal-Aware Learning for Diabetic Retinopathy Grading **Presenter:** ***Leilei Dong,*** Shihezi University, China **Authors:** *Leilei Dong, Yuqin Niu, Xuening Liu, Nan Lian, Hongmei Fei, Xin Tian, Yunfei Wang, Jie Zhou*	24

Technical Session II

Chair: *Chen Chen*, Shanghai Jiao Tong University, China

16:05-17:05, Oct. 17, Saturday

Offline Venue: Music Room(天韵厅), (2F, Library)
Qingshuihe Campus of the University of Electronic Science and Technology of China

Time	No.	Content	Page
16:05-16:17	M102-Offline	Predictive Dynamic Remote Center of Motion Control for Robot-Assisted Needle Insertion Under Respiratory Motion **Presenter:** ***Shizhe Deng,*** National University of Singapore, Singapore **Authors:** *Shizhe Deng, Wending Zhang, Chee-Kong Chui*	24
16:17-16:29	M103-Offline	Design of a Modular Robot and Development of a ROS2-Based Hierarchical Control System **Presenter:** ***Lihao Xiao,*** Huazhong University of Science and Technology, China **Authors:** *Lihao Xiao, Yiming Huang, Fangyu Peng,Zhao Yang, Xiaowei Tang, Haoyu Huang*	25

16:29-16:41	M106-Offline	Hydrogel Nanoparticle Tomography for Arterial Stenosis Detection **Presenter:** ***Jiahui Deng,*** University of Electronic Science and Technology of China, China **Authors:** *Jiahui Deng*、*Zan Chen*、*Sun Yue*、*Yifan Chen*	25
16:41-16:53	M107-Offline	Reliability-Aware Scheduling for Frame-Structured Multi-Track-Hopper DNA Molecular Communication **Presenter:** ***Ruifeng Yu,*** Chengdu University of Technology, China **Authors:** *Ruifeng Yu, Jinyan Fu, Quanhong Yu, Yifan Chen and Yue Sun*	26
16:53-17:05	M105-Offline	Text2Dashboard: Governed Generative AI for Healthcare Analytics **Presenter:** ***Yiou Wu,*** University College London, UK **Authors:** *Yiou Wu, Ningwei Bai, Liuhaichen Yang, Zezhi Tang*	26

Poster Session

Chair: *Chen Chen*, Shanghai Jiao Tong University, China

15:00-15:15, Oct. 17, Saturday

Offline Venue: Movie Room(光影厅), (2F, Library)
Qingshuihe Campus of the University of Electronic Science and Technology of China

M104	Multimodal Quality Scoring for Robotic Carotid Artery Scanning via Anatomical Priors and Physical Interaction Fusion **Presenter:** ***Manzhi Wang,*** Chinese Academy of Sciences, China **Authors:** *Manzhi Wang, Yi Yang, Zhaokun Deng, Mingrui Hao, Chen Chen, Shuangyi Wang*

ABSTRACT

Technical Session I	
Time	**Content**
16:05-16:17 Oct. 17	**M085*:** DRLKC3D: Dense Re-parameterized Large-Kernel 3D Convolution for UPDRS Toe-Tapping Assessment **Presenter:** ***Haoyu Tian,*** Qingdao University of Science and Technology, China **Authors:** *Haoyu Tian, Tongjie Zhang* **Abstract:** Toe-tapping is routinely assessed in the Unified Parkinson's Disease Rating Scale (UPDRS), yet automatic videobased assessment of this lower-limb task remains underexplored. Clinically relevant signs, including reduced amplitude, rhythm irregularity, hesitation, and progressive decrement, exhibit complex spatio-temporal patterns. We propose a compact dense re-parameterized large-kernel 3D convolutional backbone (DRLKC3D) for direct UPDRS score prediction from Parkinsonian toe-tapping videos. DRLKC3D employs a dual-branch largekernel module to capture long-range spatio-temporal dependencies and local motion patterns with substantially fewer trainable parameters. The linear branches can be equivalently re-parameterized into a single dense large-kernel convolution for efficient and hardware-friendly inference. On a 1026-clip PD toe-tapping dataset with patient-level 5-fold cross-validation, DRLKC3D achieved an accuracy of 41.24 ± 5.24% and a balanced accuracy of 44.28 ± 3.37%. These results demonstrate the feasibility of large-kernel 3D video modeling for objective toe-tapping assessment while highlighting the challenges of finegrained UPDRS score prediction from limited clinical video data.
16:17-16:29 Oct. 17	**M086*:** Explainable Ensemble Learning for Heart Disease Prediction with Bayesian Optimization **Presenter:** ***Kwok Tai CHUI,*** Hong Kong Metropolitan University, Hongkong, China **Authors:** *Ritika Kalia, Sudhakar Kumar, Sunil K. Singh, Dhruv Bali, Mani Bansal, Shavi Bansal, Brij B. Gupta, Kwok Tai Chui* **Abstract:** Heart disease continues to be among the foremost causes of death globally and poses significant medical and economic challenges. Early and precise detection of heart disease is crucial in the timely clinical management of patients. However, traditional approaches to diagnosis typically involve the manual effort of experienced personnel and clinical examination of patients, leading to inefficient and delayed diagnosis. In this study, we present an Explainable Ensemble Learning model for heart disease prediction. The framework leverages heterogeneous ensembles, Bayesian hyperparameter tuning, and SHAP explainability. In the proposed framework, we use Random Forest, XGBoost, CatBoost, LightGBM, and Logistic Regression as classifiers in both soft voting and stacking ensemble ap-proaches. Optimal hyperparameters for each classifier are tuned using Optuna's Bayesian optimization approach by running 40 optimization runs. Experimental

	analysis was done on a clinical data set having 920 records which were split into 736 training and 184 test sets using stratified 80:20 ratio. In the case of individual algorithms, the best performance was attained by CatBoost, yielding test ROC-AUC of 0.9323 (95% CI: 0.8954 – 0.9648), accuracy 85.87%, and Brier score 0.1088. Additionally, five-fold cross-validation further validated model generalizability, with ROC-AUC metrics varying between 0.8733 ± 0.0133 in the case of Logistic Regression up to 0.8885 ± 0.0215 for CatBoost. In terms of interpretability, SHAP analysis yielded clinically valuable insights, highlighting chest pain type (cp) and cholesterol (chol) as the most significant predictors of heart disease. The developed methodology clearly shows that the integration of bayesian optimization and ensemble learning along with explainable AI significantly increases model interpretability and prediction accuracy.
16:29-16:41 Oct. 17	**M092*:** Comparative Evaluation of Models for Post-Baseline Cardiovascular Event Classification Using Multi-Source Baseline Data and Transformer-Based Fusion **Presenter:** ***Emily Chen Kuo,*** Brookline High School, US **Authors:** *Emily Chen Kuo, Tiffany Chen Kuo, Yu-Sheng Lin, and Ming-Huang Chen* **Abstract:** Sleep-related physiological characteristics have been associated with adverse cardiovascular outcomes, motivating evaluation of models that combine clinical and sleep-derived information. This study used baseline Sleep Heart Health Study (SHHS) data to classify post-baseline cardiovascular disease (CVD) event occurrence. The analytic cohort included 5,042 participants, including 1,196 with a recorded post-baseline CVD event. Twelve prespecified predictors comprised eight clinical, two questionnaire, and two polysomnography (PSG)-derived variables. The cohort was divided into a development set of 4,285 participants and an internal held-out test set of 757 participants. Logistic Regression, Extreme Gradient Boosting (XGBoost), Multilayer Perceptron (MLP), and a two-token Fusion Transformer were compared. On the held-out test set, Logistic Regression achieved the highest ROC-AUC and AUPRC point estimates (0.8184 and 0.5512). At the prespecified threshold of 0.5, the Fusion Transformer achieved the highest recall (0.7833), F1-score (0.5606), and lowest false-negative count (39). The paired bootstrap ROC-AUC difference between the Fusion Transformer and Logistic Regression was -0.0091 (95% CI: -0.0194 to 0.0009), indicating no clear discrimination difference. Logistic Regression showed the best overall calibration, whereas the Fusion Transformer systematically overestimated event probabilities. Post-hoc SHapley Additive exPlanations (SHAP) analysis showed that Fusion Transformer attribution was concentrated predominantly in clinical/questionnaire predictors, with substantially smaller magnitudes for the two PSG-derived predictors. Overall, the models exhibited different operating characteristics rather than uniform superiority.
16:41-16:53 Oct. 17	**M094*:** Dynamic Early Warning for Elderly Chronic Disease Patients Under Partial Temporal Observation **Presenter:** ***Honghan Ke,*** Hainan University, China **Authors:** *Honghan Ke, Yuanyuan Wu, Zikai Feng, Mengxing Huang* **Abstract:** Clinical risk decisions often must be made before a complete monitoring episode is available. We formulate threeclass dynamic early warning for 2,878 elderly chronic-disease patients under partial temporal observation. Each record includes 24 static clinical variables and ten observations of six physiological indicators. At windows of 2, 4, 6, 8, and 10 steps, models use the static profile and

	only the observed temporal prefix. Prefix statistics and a hybrid representation are evaluated using treebased learners and probability ensembles under validation-only model and threshold selection. On 576 held-out cases, Macro-F1 increases from 0.6722 at two steps to 0.9351 at ten steps, highrisk recall rises from 0.7383 to 0.9626, and the multiclass Brier score falls from 0.4078 to 0.0845. Cumulative high-risk warning coverage reaches 0.8972 at six steps and 0.9439 at eight steps. Bootstrap intervals, calibration, alert burden, and input ablation quantify the decision-time trade-off. Results provide internal validation only and do not establish prospective deployment or external generalization.
16:53-17:05 Oct. 17	**M098*:** Cascaded-REASON: A Framework from Contextual Understanding to Chain-of-Thought Reasoning for Clinical Decision Support Systems **Presenter:** ***Wuyang Huang,*** Hainan University, China **Authors:** *Wuyang Huang，Zikai Feng，Aslam Bhatti Uzair，Mengxing Huang* **Abstract:** In clinical decision support systems (CDSS) that integrate large language models (LLMs) and knowledge graphs (KGs), three persistent challenges hinder practical deployment: insufficient semantic parsing accuracy for unstructured medical text, low efficiency in integrating fragmented medical knowledge, and a critical lack of transparency in the reasoning process. To overcome these limitations, this paper introduces the Cascaded- REASON framework, a novel cascaded reasoning architecture designed for end-to-end intelligent clinical decision support. The framework operates through a hierarchical, collaborative mechanism: it first constructs a context comprehension layer to accurately extract standardized entities and core clinical intents from user queries; then performs dynamic, intent-aware retrieval to gather structured evidence from knowledge sources; finally integrates Chain-of-Thought (CoT) reasoning with constrained prompt engineering, leveraging a dual-path model invocation strategy to generate clinically sound, transparent, and traceable recommendations. Comprehensive comparative and ablation experiments demonstrate that Cascaded-REASON significantly outperforms existing fusion methods and strong baseline models across key metrics, including entity recognition F1-score, intent classification accuracy, and factual accuracy of generated responses.
17:05-17:17 Oct. 17	**M099*:** YOLO11n-Based Computer-Assisted Recognition of Diabetic Retinopathy Lesions in Fundus Images **Presenter:** ***Zhihao Shi,*** Shihezi University, China **Authors:** *Zhihao Shi;Yuqin Niu;Jing Xiao;Yuting Xian;Xin Tian;Yunfei Wang* **Abstract:** Small lesions, low contrast, and class imbalance complicate automated localization of diabetic retinopathy lesions. To support fundus image review, this study evaluates YOLO11n for computer assisted localization of microaneurysms, haemorrhages, hard exudates, and soft exudates. The contribution is a controlled comparison of nano detectors for generating lesion candidates, using the existing YOLO11n architecture. Experiments use the publicly available DDR dataset. A unified protocol compares YOLO11n with YOLOv5nu, YOLOv8n, and YOLOv10n on the same test set. YOLO11n achieved 48.23 percent precision and 28.99 percent mAP50, improving precision by 7.21 percentage points over YOLOv8n and mAP50 by 1.51 percentage points over YOLOv5nu. These results concern research lesion localization. Bounding boxes provide coarse spatial cues, while external validation

	across cameras and acquisition settings is still required to establish clinical screening utility.
17:17-17:29 Oct. 17	**M118*:** MFO-DRNet: Multi-Scale Feature Fusion with Ordinal-Aware Learning for Diabetic Retinopathy Grading **Presenter:** ***Leilei Dong,*** Shihezi University, China **Authors:** *Leilei Dong, Yuqin Niu, Xuening Liu, Nan Lian, Hongmei Fei, Xin Tian, Yunfei Wang, Jie Zhou* **Abstract:** Diabetic retinopathy (DR) severity grading remains challenging due to variations in lesion scale, high visual similarity between adjacent severity levels, and ordinal relationships among disease stages. To address these challenges, this study proposes MFO-DRNet, a lightweight diabetic retinopathy grading network that integrates multi-scale feature fusion with ordinal-aware learning. EfficientNet-B0 is employed as the feature extraction backbone, and a multi-scale feature alignment and fusion module is introduced to unify the channel dimensions and spatial resolutions of features from various levels, thereby preserving finegrained local lesion information while incorporating high-level semantic representations. An ordinal-aware dual-branch learning mechanism is developed to jointly model class-discriminative information and the progressive relationships among disease severity levels through a five-class classification branch and an ordinal threshold branch. Furthermore, a probabilistic correspondence between class probabilities and ordinal threshold probabilities is established, and a cross-branch consistency optimization mechanism is introduced to reduce discrepancies between the two prediction forms and improve severity estimation consistency. Experimental results on the APTOS 2019 dataset demonstrate that MFO-DRNet achieves an accuracy of 97.86% and an AUC of 99.02% for binary DR detection. For five-class DR grading, the model achieves an accuracy of 89.07%, an F1-score of 81.58%, and a QWK of 93.62%, while requiring only 4.24 M parameters. Compared with the EfficientNet-B0 baseline, MFO-DRNet improves the accuracy, F1-score, and QWK by 2.73, 10.85, and 2.58 percentage points, respectively. These results demonstrate that MFO-DRNet effectively integrates multi-scale pathological feature representation with ordinal severity modeling, improving fine-grained DR grading performance while maintaining low model complexity.
Technical Session II	
16:05-16:17 Oct. 17	**M102:** Predictive Dynamic Remote Center of Motion Control for Robot-Assisted Needle Insertion Under Respiratory Motion **Presenter:** ***Shizhe Deng,*** National University of Singapore, Singapore **Authors:** *Shizhe Deng, Wending Zhang, Chee-Kong Chui* **Abstract:** Remote center of motion (RCM) control is commonly formulated with a fixed trocar, although respiratory motion can displace the abdominal wall and invalidate this assumption. This paper presents a predictive dynamic RCM framework for robot-assisted needle insertion with a UR5e manipulator. A long short-term memory (LSTM) network predicts vertical trocar displacement 0.5s ahead from a 10s respiratory history. An artificial potential field (APF) generates needle tip attraction, obstacle repulsion, and tangential avoidance velocities.

	Damped augmented constraint inverse kinematics combines the APF command with proportional RCM correction to the predicted trocar position. The proposed method is evaluated against a fixed pivot baseline in 30 paired randomized simulations. Across the 30 pairs, the mean full-window RCM RMSE decreased by 14.7%. These results demonstrate the feasibility of the dynamic RCM method under the simulated conditions.
16:17-16:29 Oct. 17	**M103:** Design of a Modular Robot and Development of a ROS2-Based Hierarchical Control System **Presenter:** ***Lihao Xiao,*** Huazhong University of Science and Technology, China **Authors:** *Lihao Xiao, Yiming Huang, Fangyu Peng,Zhao Yang, Xiaowei Tang, Haoyu Huang* **Abstract:** To address the fixed configurations and limited task adaptability of conventional robots, as well as the difficulties in model adaptation and real-time multi-joint control after a change in robot configuration, this paper presents a modular robot and a ROS2–EtherCAT-based control system. First, three integrated joint modules with different specifications and standardized intermediate connectors were designed, and a serial robot is assembled through unified mechanical, electrical, and communication interfaces. A hierarchical motion-control architecture is then proposed. At the upper layer, ROS2 is used for robot-model management, kinematic computation, and trajectory planning. At the lower layer, EtherCAT communication and a Linux–Xenomai dual-kernel architecture are employed to enable cyclic exchange of multi-joint control commands and status data. Finally, the system is validated through experiments on real-time communication, task-cycle jitter, motion accuracy, and trajectory interpolation. The results show that the developed system achieves stable real-time communication and coordinated multi-joint control, with good cycle-time stability and trajectory-tracking accuracy. These results demonstrate the feasibility of the proposed approach for configuration expansion, motion planning, and real-time control of modular robots.
16:29-16:41 Oct. 17	**M106:** Hydrogel Nanoparticle Tomography for Arterial Stenosis Detection **Presenter:** ***Jiahui Deng,*** University of Electronic Science and Technology of China, China **Authors:** *Jiahui Deng, Zan Chen, Sun Yue, Yifan Chen* **Abstract:** Atherosclerosis is a major contributor to cardiovascular disorders. including heart attack, stroke, and peripheral artery disease. Progressive vascular wall remodeling leads to plaque accumulation within blood vessels, resulting in lumen narrowing and impaired blood circulation. Early identification of vascular abnormalities is essential for reducing disease progression; however, reliable approaches for detecting early-stage lesions remain limited. In this paper, we propose a novel hydrogel based nanoparticles (NPs) sensing method for arterial stenosis, namely, NP tomography (NPT). Deformable hydrogel particles with predefined initial spacing are transported through transparent vessels containing stenosis with different severities and locations. The downstream inter-particle distances are extracted through image analysis to characterize the spatial redistribution of particle groups. Experimental results indicate that stenosisinduced local flow variations modify the particle spacing distribution, thereby encoding upstream geometric information into the downstream particle configuration. The proposed experimental framework provides a non-invasive sensing approach for

	earlystage vascular stenosis analysis.
16:41-16:53 Oct. 17	**M107:** Reliability-Aware Scheduling for Frame-Structured Multi-Track-Hopper DNA Molecular Communication **Presenter:** ***Ruifeng Yu,*** Chengdu University of Technology, China **Authors:** *Ruifeng Yu, Jinyan Fu, Quanhong Yu, Yifan Chen and Yue Sun* **Abstract:** Molecular communication (MC) provides a promising communication paradigm for the Internet of Bio-Nano Things (IoBNT). DNA-based molecular communication (DNA-MC) with frame structures and track-hopper-based transmission mechanisms enables high-throughput and controllable information transmission. However, multi-track-hopper transmission poses scheduling challenges because of heterogeneous transmission success probabilities and frame priorities. This work proposes a reliability-aware scheduling mechanism for frame-structured multi-track-hopper DNA-MC that decouples transmission success probability from service time. The proposed Weighted Shortest Queue First (WSQF) mechanism derives real-time reliability estimates from completed transmissions and jointly considers track-hopper occupancy, reliability, and frame priority during channel selection. Results averaged over 30 runs per scenario show that WSQF outperforms Round Robin (RR) and Shortest Queue First (SQF). At a system load rate of 0.85, WSQF achieves a successful throughput of 15.35 frames per time unit and a transmission success rate of 88.10%, compared with 13.40 frames per time unit and 76.9% for SQF. WSQF also improves the transmission success rate of Urgent frames from 71.9% to 93.24%. These results show that reliability-aware scheduling improves transmission performance and supports differentiated service in multi-track-hopper DNA-MC systems.
16:53-17:05 Oct. 17	**M105:** Text2Dashboard: Governed Generative AI for Healthcare Analytics **Presenter:** ***Yiou Wu,*** University College London, UK **Authors:** *Yiou Wu;Yuqin Niu;Jing Xiao;Yuting Xian;Xin Tian;Yunfei Wang* **Abstract:** Text2Dashboard is a governed generative-AI agent for healthcare analytics that converts natural-language requests into verified dashboards. It separates probabilistic planning from deterministic execution, governing metadata grounding, query execution, approval, state persistence, completion, and artifact validation. Evaluation on a proprietary analytics platform shows improved query-output contract compliance and termination reliability. Explicit output contracts yielded six successful SQL executions in follow-up experiments, while completion-control ablations improved runtime behaviour. The framework provides a reusable architecture for healthcare-oriented analytics with controlled tool access, traceability, and verifiable outputs, without automating clinical decision-making.

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TRANSPORTATION GUIDE

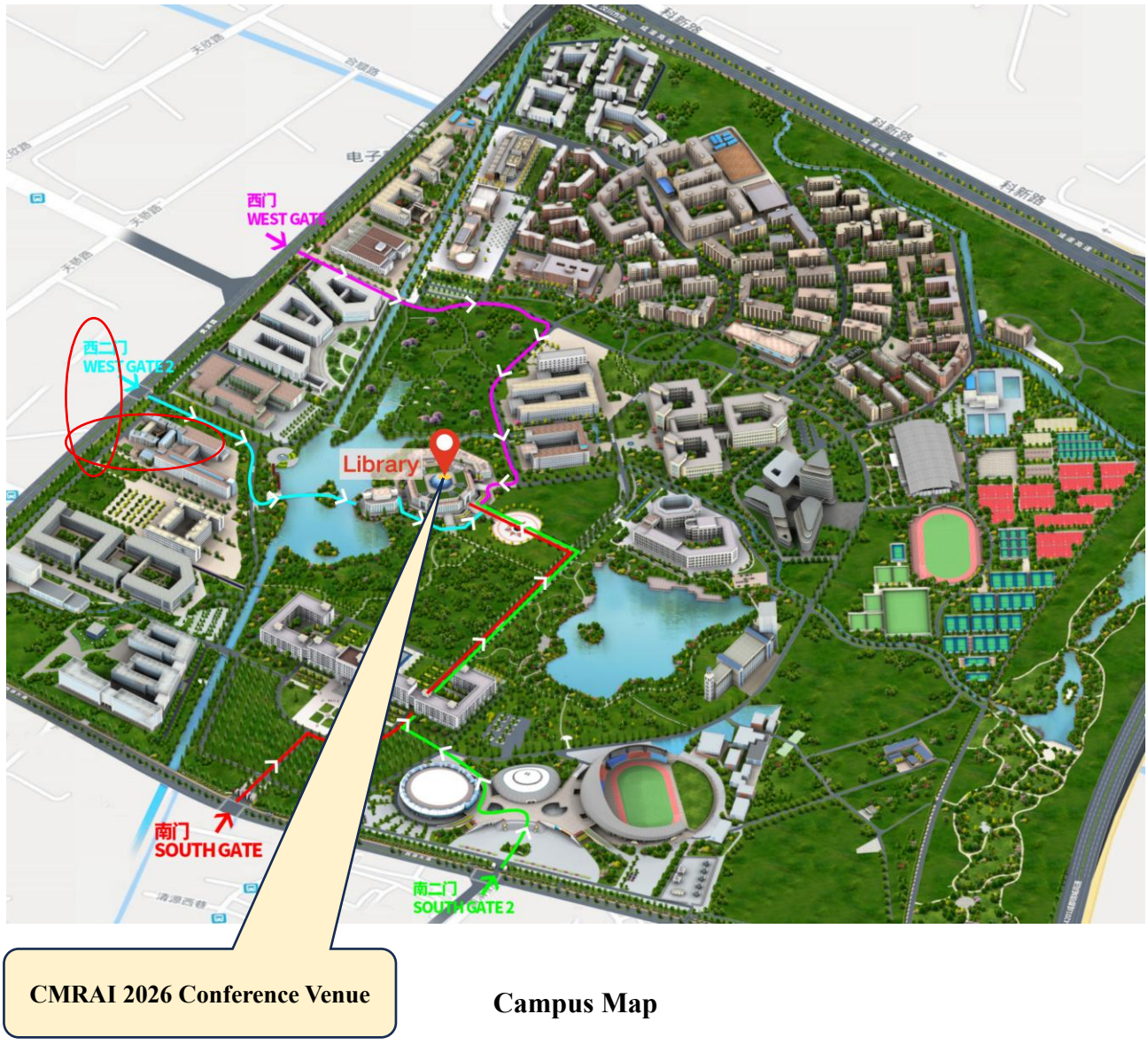
CMRAI 2026 会议交通指南

Conference Venue: Qingshuihe Campus of University of Electronic Science and Technology of China

会议地点：电子科技大学（清水河校区）

Address: No. 2006, Xiyuan Avenue, Gaoxin District, Chengdu, Sichuan Province

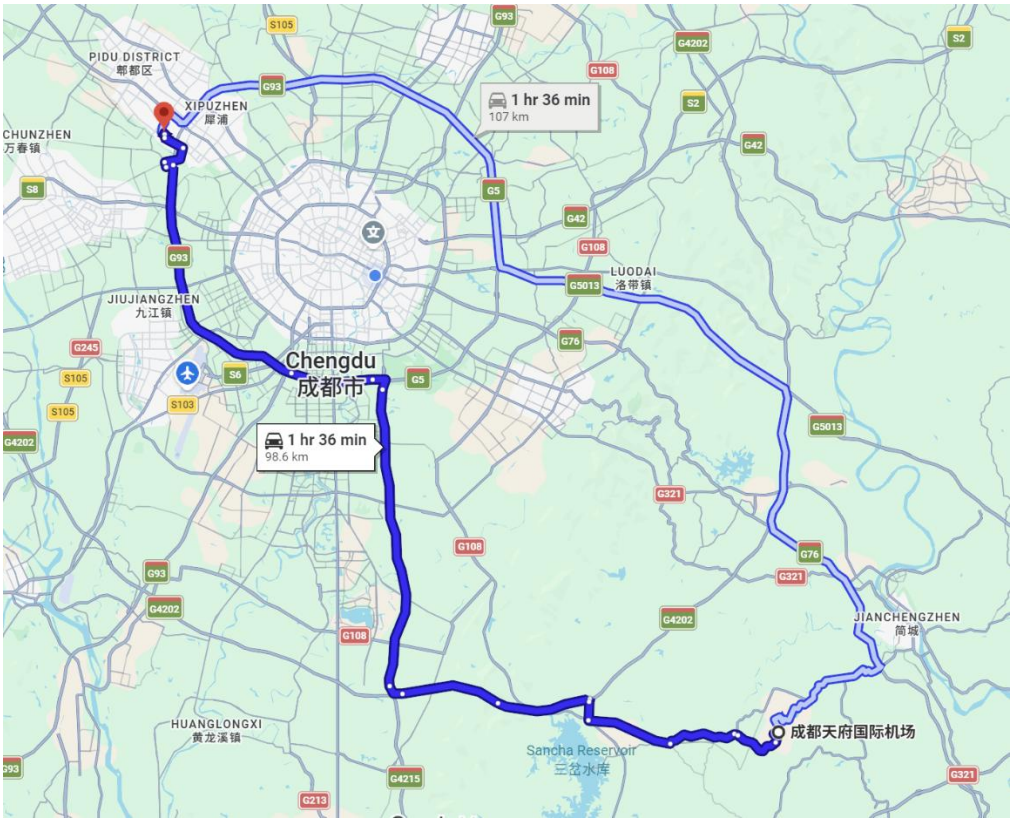
地址：成都市高新西区西源大道 2006 号



Campus Map

✈ • • Chengdu Tianfu International Airport—University of Electronic Science and Technology of China Qingshuihe Campus

成都天府国际机场——电子科技大学清水河校区



① Public Transport | 公共交通 (about 2 hours 大约 2 小时)

Take Metro Line 18 (towards South Railway Station) from Tianfu Airport Terminal 1 & 2 (Entrance) →transfer to Metro Line 9 (towards Huangtianba) at Fuhuayuan Station→exit Huangtianba via Exit D →take Tram Rong Line 2 (towards Pixian West Railway Station) →UESTC Station→walk 2 minutes → UESTC (Qingshuihe Campus).

在天府机场 1 号 2 号航站楼(出入口进)搭地铁 18 号线（火车南站方向）→孵化园站换乘地铁 9 号线（黄田坝方向）→黄田坝下车（D 口出）→有轨电车蓉 2 号线（郫县西站方向）→电子科大站下车→步行 2 分钟→到达电子科技大学（清水河校区）

② Call a taxi | 打车 （about 1h 大约 1 小时）

Based on the shortest distance by car (about 1 hour)——About 150RMB

按驾车的最短路程计算，成都天府国际机场距离电子科技大学清水河校区约 85 公里 （全程约 1 小时）

✈ • • Chengdu Shuangliu International Airport—University of Electronic Science and Technology of China Qingshuihe Campus

成都双流国际机场——电子科技大学清水河校区



③ Public Transport | 公共交通 (about 1 hour 大约 1 小时)

Take Metro Line 10 (towards Wuhou Shrine) from Shuangliu Airport Terminal 1 (Entrance A) → transfer to Line 9 (towards Huangtianba) at Huaxing Station→exit Huangtianba via Exit D→take Tram Rong Line 2 (towards Pixian West Railway Station) →UESTC Station→walk 2 minutes→ UESTC (Qingshuihe Campus).

在双流机场 1 航站楼(A 口进)搭地铁 10 号线（武侯祠方向）→华兴站换乘地铁 9 号线（黄田坝方向）→黄田坝下车（D 口出）→有轨电车蓉 2 号线（郫县西站方向）→电子科大站下车→步行 2 分钟→到达电子科技大学（清水河校区）

④ Call a taxi | 打车 （about 30mins 大约 30 分钟）

Based on the shortest distance by car (about 30 minutes)——About 50RMB

按驾车的最短路程计算，成都双流国际机场距离电子科技大学清水河校区约 25 公里 （全程约 30 分钟）

NOTE